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NORTHERN POWDER RIVER TRACT PROFILE

NORTHWEST OTTER CREEK

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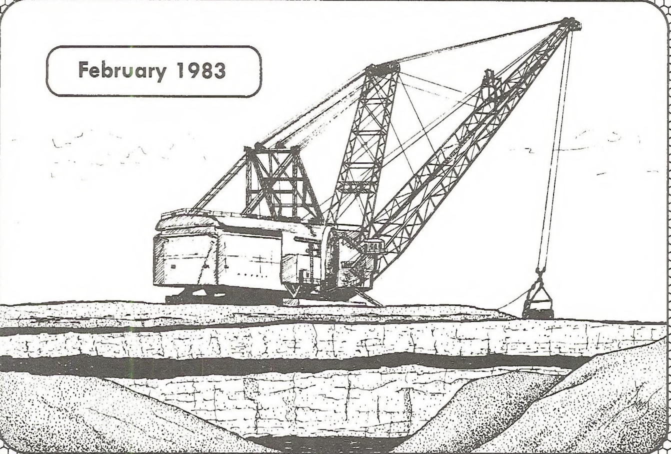

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POWDER RIVER RESOURCE AREA TRACT PROFILE
NORTHWEST OTTER CREEK

PART I: SITE-SPECIFIC ANALYSIS OF THE NORTHWEST OTTER CREEK COAL LEASE TRACT

By Bureau of Land Management

PART II: TRACT SUMMARY REPORT, NORTHWEST OTTER CREEK

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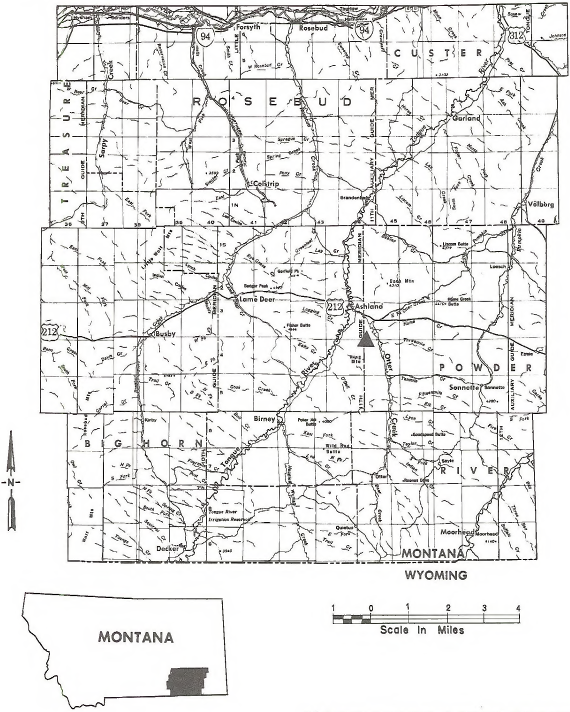
UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

PART I

Site-Specific Analysis
Northwest Otter Creek Coal Lease Tract
Rosebud and Powder River Counties, Montana

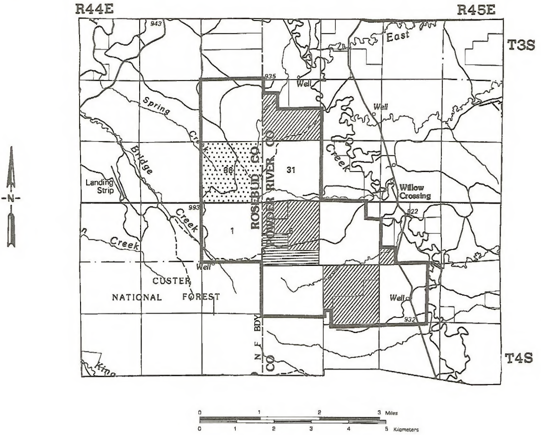
Miles City District Office
Miles City, Montana

February 1983



▲ Tract

NORTHWEST OTTER CREEK
LOCATION MAP



NORTHWEST OTTER CREEK

▨ Meets BLM Further Consideration for Coal Leasing Requirements

▤ By-Pass Coal

░ Existing State Surface and Subsurface Mineral Leases

— Tract Boundary

DESCRIPTION OF THE PROPOSED ACTION

The proposed action is to offer for competitive lease a 5,475-acre tract of land in western Powder River County, Montana. The tract, which contains 317.6 million tons of recoverable coal, of which 55.8 million tons are known to be leased. This comprises an area identified as an economical mining unit for the development of a 40-year strip mining operation. It is located approximately five miles southeast of Ashland and one mile south of U.S. Highway 212. The maps preceding this page show the general and legal location of the tract. Attachment A to Part II gives a legal description of the tract.

In preparing to offer this tract, personnel from the BLM, Miles City District, inventoried to determine the site specific resource values and then analyzed the potential environmental effects from coal development on this individual tract. Total surface disturbance was assumed to present a worst case scenario. Previous planning included application of surface owner consultation, multiple use and unsuitability criteria (43 CFR 3461). Any new findings of unsuitability are reflected in the delineations and development of the tract described in this profile.

The tract contains, in place, 106.2 million tons of federal coal, 68.0 million tons of state coal, and 224.0 million tons of private (fee) coal. The 640 acres of state coal are leased and will not be considered as part of the affected environment in this profile. Annual production assumed from the mining unit would be 7.9 million tons. Approximately 355 persons would be employed during construction and 237 during production.

Surface disturbance would be about 90 acres each year. A total of 5,475 acres would be disturbed by mining. If mine facilities are located outside the tract, some additional surface acreage would be disturbed. Railroad access to connect with the proposed Tongue River Railroad would disturb approximately 36 acres of land. This does not include the acreage that would be disturbed by the Tongue River Railroad itself. More specific information on the proposed mining operation is available in Part II, "Tract Summary Report," prepared by Resource Evaluation.

It is assumed that proper mining and reclamation would be carried out according to existing state and federal regulations. These include: Office of Surface Mining Reclamation and Enforcement (30 CFR 700-899); Environmental Protection Agency (40 CFR 0-399); Department of the Interior's coal management program regulations (30 CFR 211, 43 CFR 23, and 43 CFR 3400); and the regulations of the Montana Department of State Lands.

CHAPTER I
AFFECTED ENVIRONMENT

GEOLOGY AND TOPOGRAPHY

Geology

The surface rocks are all within the Paleocene Tongue River Member of the Fort Union Formation. The rocks primarily consist of sandstones, siltstones and some shales.

At least six persistent coal seams greater than five feet thick are present. Thinner coal seams are also present. Currently, the Knobloch seam is the only potential economically mineable seam within this tract. Estimated average seam thickness is 62 feet. The coal ranks as subbituminous C. Per pound, the BTU content is about 8,700. Ash content is about 5.2% and sulfur content is about 0.15%. Estimated recoverable tonnage is 261.8 million.

No valuable mineral deposits are known to exist in the tract, other than coal and possibly scoria. About 1,500 acres of Knobloch scoria lies in the tract. A few small gravel deposits have been mapped within the general area of the Otter Creek alluvial valley floor.

No commercial oil and/or gas wells have been drilled within the tract.

Paleontological resources are not particularly important. The resource present consists primarily of leaf impressions. Some fresh water fossil shells may be present. One of the thin coal seams may have an associated fossil tree zone present. Further south and east of this locality, such an association does exist.

Topography

The elevation range is from a low of about 3,030 feet near Otter Creek, to a high of about 3,610 feet near the very rugged south end of the Otter Creek-Tongue River drainage divide.

The whole area is dissected by small intermittent streams. These intermittent streams vary between two to four miles in length until joining the Tongue River or Otter Creek.

The major drainage divide of Otter Creek-Tongue River, lies in the westernmost tier of sections. The southwestern most section has the roughest terrain and the greatest relief. Elevation changes of 200 feet within a quarter mile are common. Slopes of 50% are common.

The area's northern third primarily consists of light to moderately rolling uplands eroded by several large coulees. These coulees drain into both Otter Creek and Tongue River.

The southern and eastern half of the area consists of rolling uplands cut by coulees. The western boundary, adjacent to Custer National Forest, consists of rough, steep terrain near the major drainage divide. The eastern boundary lies within the Otter Creek alluvial valley floor. All drainages here flow into Otter Creek.

SOILS

Soils are composed of deep, clayey (Fergus, Kobar) and loamy (Cooers, Yamac) soils on nearly level to gently sloping (0-4%) fans, footslopes and terraces; moderately deep calcareous soils (Birney, Delpoint, Thurlow) over softly consolidated siltstones and sandstones on moderately sloping to strongly sloping (4-15%) side slopes; and shallow (Cabbart, Kirby, Yawdim) calcareous soils on moderately steep to very steep side slopes.

Many mapping units throughout the coal area occur as complex, variable patterns of deep, moderately deep and shallow soils, some of which include rock outcrops.

The soils data is from the Powder River County Order II published survey and the Rosebud County Order II soil survey maps and soil description sheets.

WATER RESOURCES

Groundwater

Several aquifers exist in this tract. Shallow aquifers are unconfined and include alluvium, clinker, coal, and lenticular bodies of silt and sand. The 150-160 foot Lebo Shale Member of the Fort Union Formation separates these water-table aquifers from deeper, confined aquifers, which include the Tullock Member of the Fort Union Formation, Hell Creek and Fox Hills aquifers, various sandstones and shales, and the Madison Group.

Depth to water, measured in water wells and test holes in the area, ranges from 230 feet along drainage divides to 38 feet along Home Creek and 43 feet along Threemile Creek.

The Knobloch coal seam is saturated in the tract and is a main source of water. Wells in the Tongue River Member of the Fort Union Formation and in alluvium yield from 4 to 12 gallons per minute (gpm) in the Otter Creek coalfield. Specific capacity averages 0.1 gpm per foot of drawdown. Transmissivities are generally less than 200 gpm per foot. Average velocity of groundwater flow through the unconfined aquifer is estimated to be 0.03 foot per day.

Deeper aquifers generally yield greater quanitites of water. Water from the Tullock Member of the Fort Union Formation flows from wells along Otter Creek with rates as great as 20 gpm. The basal Hell Creek-Fox Hills aquifer lies about 1,600 feet below land surface and may be as much as 300 feet thick. Water from this aquifer and the remaining deep aquifers would be expected to flow at the surface. The Judith River Formation, the Eagle Sandstone and the Muddy Sandstone lie about 3,000, 3,600 and 6,500 feet, respectively, below land surface. The top of the Madison group is about 8,000 feet below land surface and is about 900 feet thick. The potentiometric surface is estimated to be about 300 feet above land surface.

Groundwater quality types for the area vary from sodium bicarbonate to sodium sulfate and sodium magnesium sulfate. All water-table samples in the coal area are high to very high in salinity hazard; sodium hazard generally is very high to extremely high. All samples collected exceeded standards for drinking water in dissolved solids and dissolved sulfate concentrations. Dissolved solids concentration in samples from virtually all test holes was below upper limits for stock water. The Knobloch coal has an overall effect of improving the chemical quality of groundwater. Total dissolved solids concentrations (TDS) for deeper aquifers is similar to the shallow ones. Water from the Tullock Member has an average TDS of 1,260 milligrams per liter (mg/l); Judith River water can exceed 6,000 mg/l; Muddy Sandstone Member can exceed 5,000 mg/l; water within the Madison Group may contain nearly 2,000 mg/l.

Two stock or domestic wells exist within the tract and seven more wells exist in close proximity to the site.

Direction of groundwater flow in the shallow aquifers is toward Otter Creek.

Surface Water

Otter Creek is the only major stream in the vicinity of the tract. Stream flow is measured at Ashland, about six miles north (downstream). Mean annual yield is 6.22 acre feet per year (ac ft/yr) or 0.54 cubic feet per second (cfs) (USGS 1979). Approximately 4,200 acres of the drainage is irrigated, mostly by waterspreading (Knapton and McKinley 1977). Subirrigation is relied upon to supply moisture during the summer. Water quality data is available above and below the site (See Regional paper, unpublished manuscript in Miles City District Office of BLM). TDS concentrations, an index to salinity, varies from 228 to 2,690 mg/l and is seldom measured below 2,000 mg/l. Lower concentrations occur during high flows from snowmelt and storms in the winter and early spring. Sediment yield varies from 0-0.2 for bottomlands to 0.8-1.2 ac ft/sq mi/yr for hillslopes (EMRIA 1975).

Two stock ponds are shown on the tract by topographic maps. Neither of these are perennial. More reservoirs may have been built since the maps were printed. An additional reservoir exists on public land that is not shown on the maps.

Alluvial Valley Floors and Floodplains

A floodplain and an alluvial valley floor (AVF) along Otter Creek, just east of the tract, have been preliminarily identified. A small portion of each of these falls within the eastern boundary of this tract (BLM 1979).

Until it can be determined whether there is a substantial threat of loss of life or property, no portion of the floodplain will be declared unsuitable. Office of Surface Mining (OSM) and Department of State Lands determination of the existence and extent of this potential AVF will have to be made prior to mine permit approval.

VEGETATION

The Northwest Otter Creek coal tract consists of approximately 4,835 surface acres. Of that, 4,725 surface acres (97.72%) of the area is rangeland. The balance is 110 acres (2.28%) of cropland. The rangeland consists of five dominant range sites. These range sites are shallow, shallow clay 1,378 acres (29%), shallow, silty 762 acres (16%), grazeable woodlands 504 acres (11%), shallow clay 409 acres (9%), silty 335 acres (7%) of the coal tract. Other range site complexes total 1,337 acres (28%) of the coal tract. Within these range sites, there are varying production yields (pounds per acre) and condition classifications. The shallow, shallow clay site produced 260 AUMs (26%), shallow silty 258 AUMs (25%), grazeable woodlands 95 AUMs (9%), shallow clay 77 AUMs (8%), silty 85 AUMs (8%), and other range site complexes 249 AUMs (24%) on the coal tract. There are approximately 1,024 AUMs being produced per year on the coal tract in its present condition.

AGRICULTURE

Of the 4,835 surface acres, only 10.0 % (484 acres) of the area is suitable for cropland (Class II, III and IV land). Of that amount, only 2.28% (110 acres) is currently being used as cropland. The balance is Class VI through VII, which is only suitable for rangeland, watershed and wildlife.

Agricultural operations are mainly livestock with small areas of hay (alfalfa or grass legume), small grains and tame pasture. See Table NWO-1. Hay or small grains are mainly grown for livestock feed during the winter months. Some small grains are grown for sale.

This area currently has 70 acres of Class II, III and IV land (1.45%) in hay, which produces approximately 83 tons per year under dryland conditions. About 56 acres could be or are irrigated which would produce approximately an additional 218 tons of hay per year.

Approximately 40 acres of Class II and III land (0.83%) are in tame pasture, which will provide approximately 36 AUMs per year under dryland conditions. These acres could be or are irrigated and would provide an additional 444 AUMs.

In addition, there are approximately 355 acres of Class II, III and IV land (7.33%) which are not presently cropped, but are suitable for cropland. This land could produce approximately 310 tons of hay or 3,306 bushels of wheat under dryland farming operations. Wheat production is based on the assumption that 50% of the cropland is summer fallowed. Of that acreage, there are 52 acres which could be irrigated and yield an additional 188 tons of alfalfa hay or 3,065 bushels of wheat. There is an additional 19 acres of Class IV land (0.39%) that is only suitable for tame pasture that could produce 17 AUMs. This land is currently being utilized as rangeland.

OWNERSHIP AND LAND USE

Table NWO-2 displays the ownership of surface and coal in the Northwest Otter Creek tract. Within this tract 2,716 acres are held by energy-related landowners. Table NWO-3 displays surface ownership in the tract by landowners not related to energy and the relationship between their holdings in the tract to their ownership inside of a boundary approximately two miles outside the perimeter of the tract. (Note that this table does not portray the relationship of the landowners' tract ownership to their total land holdings.)

TABLE NWO-2
OWNERSHIP OF SURFACE AND COAL IN THE NORTHWEST OTTER CREEK TRACT

	Acreage of Surface Owned	Acreage of Coal Owned Leased	 Unleased	 Total
Private Landowners	4,438			3,484
United States	397		1,350	1,350
State of Montana	640	640		640

TABLE NWO-1
AGRICULTURAL LAND USE

PRESENT USE OF LAND	ACRES	PCT OF AREA	LAND CLASS 1/ CAPABILITY		PREDICTED AVERAGE YIELDS 2/										
					WHEAT		BARLEY		OATS		ALFALFA		TAME HAY	PASTURE	
			NON-IRRI-GATED	IRRI-GATED	DRY LAND (BU)	IRRI-GATED (BU)	DRY LAND (BU)	IRRI-GATED (BU)	DRY LAND (BU)	IRRI-GATED (BU)	DRY LAND (TON)	IRRI-GATED (TONS)	DRY LAND (TONS)	DRY LAND (AUMS)	IRRI-GATED (AUMS)
Privately Owned															
Cropped (Hay)	56	1.16	III	II	1,344	2,912	2,184	3,640	2,912	4,368	62	280	45	50	672
Cropped (Hay)	14	0.29	III	–	252	–	350	–	–	–	21	–	17	18	–
Total	70	1.45	–	–	1,596	2,912	2,534	3,640	2,912	4,368	83	280	62	68	672
Cropped (Tame Pasture)	40	0.83	III	II	1,149	2,215	1,830	2,978	676	3,579	39	214	35	36	480
Total Cropped Land	110	2.28	–	–	2,745	5,127	4,364	6,678	3,588	7,947	122	494	97	104	1,152
Privately Owned															
Non-Cropped (Range)	2	0.04	III	II	48	104	78	130	104	150	2	10	2	2	24
Non-Cropped (Range)	50	1.03	III	III	1,034	2,420	1,654	3,222	900	4,080	45	225	38	45	482
Non-Cropped (Range)	179	3.70	III	–	3,956	–	6,107	–	6,080	–	218	–	174	192	–
Non-Cropped (Range)	124	2.56	IV	–	1,575	–	2,250	–	–	–	45	–	38	89	–
Total	355	7.33	–	–	6,613	2,524	10,089	3,352	7,084	4,236	310	235	252	328	506
Federal Land															
Non-Cropped (Range)	19	0.39	IV	–	–	–	–	–	–	–	–	–	–	17	–
Total	19	0.39	–	–	–	–	–	–	–	–	–	–	–	17	–
Total Non-Cropped (Range)	374	7.72	–	–	6,613	2,524	10,089	3,352	7,084	4,236	310	235	252	345	506

1/ Soil capability classification is derived from unpublished Rosebud County Soil Survey report and published Powder River County Soil Survey report.

2/ Cropland, land suitable for cropland and acreage predicted crop yield derived from unpublished Rosebud County Soil Survey report, published Powder River County Soil Survey report, and data from Agriculture Stabilization and Conservation Service, Rosebud County and Powder River County.

TABLE NWO-3

SURFACE OWNERSHIP BY PRIVATE LANDOWNERS WITHIN THE NORTHWEST OTTER CREEK COAL TRACT AND THE RELATIONSHIP TO THEIR HOLDINGS WITHIN A TWO-MILE BOUNDARY

Owner Number	Acreage Owned in This Tract	Acreage Owned Over Federal Coal in This Tract	Percentage of Owner's Tract Holdings to His Holdings Within a Two-Mile Boundary
1	80.00	—	4.7
2	2.61	—	6.1
3	314.20	—	39.6
4	627.35	—	50.1
5	57.39	—	12.5
6	640.00	—	9.8

In 1979 the BLM conducted a survey of the private landowners overlying federal coal in the Northwest Otter Creek tract. At that time it was discovered that all of the landowners were in favor of having the coal mined.

WILDLIFE

There is a limited generalized use of the tract by mule deer and antelope (BLM Tract Profile). The bald eagle has been observed as a migrant in the area. No other threatened or endangered species occurs on or near the tract (BLM Tract Profile).

Two sharp-tailed grouse leks occur on the tract. Neither is over federal coal (Martin 1980).

An analysis was made of the aquatic resources in the Otter Creek drainage (Morris 1982). It showed that although there is no significant sport fishery in the tract area, care must be taken to protect the quality of the downstream waters which do provide spawning habitat for various sport fish.

CULTURAL RESOURCES

All (100%) of the unleased federal estate in the Otter Creek tract has been examined to Class III intensity. A total of 24 cultural sites have been located in the area, to which unsuitability Criterion 7 was applied in the Powder River Coal EIS. The following determinations have been made:

Sites eligible for the National Register — 24 PR 495, 496, 497, 552, 565, 566, 678

Sites lacking sufficient information for a determination — 24 PR 29, 52, 567, 682, 706

Sites not eligible for the National Register — 24 PR 28, 494, 551, 553, 554, 599, 600, 676, 677, 679, 680, 681.

RECREATION

This tract is relatively isolated from recreational use or demand. There is no recreational development in or near the area. Some very limited hunting use may occur. Since no public access exists, any use of the tract for recreation would require landowner permission. This restriction, along with remoteness from population centers, effectively prohibits use of the area. The area contains no wilderness potential. Several miles west of this tract lies the Northern Cheyenne Indian Reservation and adjacent to the tract lies the Custer National Forest. A few miles southwest of this tract lies an area administratively recommended for wilderness by the Custer National Forest.

VISUAL RESOURCES MANAGEMENT

The tract is located in an area used exclusively for ranching and some farming. The scenic quality is fairly good with low mountains, forested hills and some breaks in or near the area. This area lies in scenic quality classes B and C with C predominant. This area contains scenic quality categorized as predominantly Class C, because of its largely common physiographic and vegetative characterisitics. There are some limited areas of uniqueness in land form, color and vegetation which are categorized as Class B.

CLIMATE AND AIR QUALITY

The Otter Creek area has a continental-type climate. Torrential rainstorms are common and unprotected soil surfaces may erode severely during these storms. Average annual precipitation at Birney is 13.7 inches and is fairly typical of the area. About 75% of the precipitation falls as rain during the growing season. Greatest snow accumulations occur in January and February, however in a common year, most snowfall blows into drifts in depressions, leaving fields and roads fairly bare. The growing season for hardy grasses (28°F) in average years is 131 days. Frost-free days occur for 108 to 120 days a year. Estimated potential evapotranspiration is 26 inches. Winds are predominantly from the west to north-northwest (35%) and the southeast to south (27%). Annual average wind speed is four mph. The climate here is suited for reclamation of surface mined land, because spring rains are generally adequate for establishing stands of native vegetation.

Although terrain offers little obstruction to dispersion of pollutants, the area experiences prolonged periods of depressed mixing heights and low windspeeds, which tend to concentrate pollutants.

This tract's air quality is generally very good. Background level for suspended particulate was determined by PEDCo Environmental to be 20 micrograms per cubic meter (mcg/m^3), but annual geometric means range from 9 mcg/m^3) to 56 mcg/m^3. Gaseous pollutants are currently so low they are not even monitored.

One Class I area, the Northern Cheyenne Indian Reservation, lies about two miles to the west of this tract. Visibility in the area ranges from 45 to 70 miles with a median summer visual range of about 60 miles.

NOISE

Data on existing ambient noise levels for a specific area is typically nonexistant. However, this area is expected to have noise levels commonly experienced in rural and rangeland areas. Typical day-night sound levels for rural areas are estimated to be from 35 to 50 decibels (dBA) (DEIS for East Decker Coal Mine). A normal conversation is equivalent to 50 to 60 dBA. (Powder River Coal FEIS).

TRANSPORTATION FACILITIES

The Northwest Otter Creek tract lies 1.5 miles south of U.S. Route 212. The Otter Creek road (a graveled county road) runs north to south to the east of the tract. Most of this road parallels the tract but about a mile of the road crosses the southeast portion of it. The tract is located approximately 85 miles from the Burlington Northern rail lines at Miles City.

SOCIOECONOMICS

Employment and Income

The Northwest Otter Creek tract is located in western Powder River County and eastern Rosebud County near the town of Ashland, which is predominantly an agricultural community.

Powder River County's market value of all agricultural products sold in 1978 was $18,831,000. The market value of agricultural products from Rosebud County in 1978 was $28,997,000. Powder River County averaged $54,426 per farm/ranch while Rosebud County averaged $82,850. The average per farm/ranch for the State of Montana was $48,412 in 1978.

Cattle production was the leading contributor for both counties. Cattle production produced approximately $22,527,000 in Rosebud County and $15,463,000 in Powder River County in 1978.

Hay production sales totaled $916,000 in Powder River County and $801,000 in Rosebud County.[1]

---

[1] Census of Agriculture 1982. Department of Commerce, U.S. Government Printing Office, Washington, D.C.

Powder River County experienced some growth in 1970 due to oil and gas exploration but in the last decade has experienced a 12% loss in population.

Rosebud County, on the other hand, has experienced a 39% increase in the past 10 years. This is primarily due to the increased activity at Colstrip. See Table NWO-4.

TABLE NWO-4
POPULATION

	1960	1970	1980	% Change 1970-1980
Powder River County	2,485	2,862	2,520	-12%
Rosebud County	6,187	6,032	9,899	+39%

Source: 1980 Census Report, Research and Information Systems Division, Montana Department of Administration, 1981.

Per capita income in Powder River County is greater than for Rosebud County and the State of Montana. See Table NWO-5.

TABLE NWO-5
PER CAPITA INCOME

Montana	$8,652
Powder River County	$9,092
Rosebud County	$7,930

Community Facilities

The Northwest Otter Creek coal tract is located near Ashland. This is an unincorporated community that has not shown a tendency to grow with the coal development.

A BLM contracted Social Effects Project research report discloses that Ashland has not changed even though Rosebud County has undergone some extensive changes caused by the impacts of energy development. There are several reasons for this.

First, Ashland is geographically isolated from the rest of the county. The distances are too far for commuting, the roads are not very good, and the routes are somewhat roundabout.

A second reason why Ashland has not been affected by development in Rosebud County is that Ashland offers few attractive features that would lure new residents. In particular, there are no medical facilities, excess housing, recreational opportunities, or shopping.

These are the primary reasons why Ashland has not yet been affected by the development that is occurring in Rosebud County. Indeed, Ashland will probably change only when development occurs in the immediate area, causing Ashland to be the logical place to live.[2]

The Northern Cheyenne and the Crow Indian Reservations are considered as a home and refuge. Agriculture does not contribute significantly to the overall economy of either reservation. The reservation economies are based on jobs provided by the tribal government and federal programs. There has been a slow shift from a subsistence to a cash economy, but most households still rely on hunting and gathering to supplement their incomes. Chronic unemployment is a serious problem.

Due to sparse population, most people, consumer goods and agricultural products move by roadways. The road network is not well developed, but is generally adequate for the existing population.

A loose network of county and Bureau of Indian Affairs roads provides ranchers and rural residents access to the primary and secondary road systems. These are mostly gravel-surfaced, with curves and grades conforming closely to the existing terrain. (Montco Mine Plan EIS Draft).

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[2] The BLM Social Effects Project Summary Research Report, Miles City District Office, July 1982.

Existent Attitudes

Several surveys over the past five years in the area have shown, on a fairly consistent basis, that most of those interviewed are in favor of mineral development. A BLM study, conducted in 1979-1980, showed the principal reasons for supporting development are national energy needs and economic growth of the region. The study also showed respondents were in favor of mining controls.

Among Indians, there is fear that an in-migration of people, just outside of the reservaion, would lead to problems of racial tension, abuse of tribal hunting and fishing, increased deterioration of roads, and a change of lifestyle from the traditional for some of the young people, thus destroying tribal customs and Indian ways of life.

CHAPTER II
ENVIRONMENTAL CONSEQUENCES

GEOLOGY AND TOPOGRAPHY

Geology

Within the mined area, the surface strata would be destroyed. The strata would be more homogenized, when replaced in the mined area.

The Knobloch seam would be removed within the mine. This would preclude future use of this coal. Any other coal seams present in the overburden would be destroyed while lower coal seams would be precluded from mining under existing laws which prevent mining reclaimed lands.

Topography

The area mined would probably have gently rolling topography. Postmining topographic relief would be less variable than present relief. Gentler slopes would decrease the velocity and amount of moisture runoff. More water would probably enter the soil, some for plant use, the remainder adding to the water table. Erosion would decrease. A common overburden coefficient of expansion is 18%. If overburden removed is less than about 340 feet thick, the average elevation of the mined area would be proportionally less than the average premine elevation.

Strata below the mined Knobloch seam would be undisturbed. Oil and gas activity would be precluded during the active mining phase. With no producing wells in the area, any potential delay in oil and gas exploration would be insignificant.

Some Knobloch scoria might be destroyed by mining. Some would be used for mine haul roads and other mine-related activities.

The paleontological resources would suffer some destruction within the mined zone. The remaining fossil material would be repositioned when replaced within the mined area.

SOILS

Soil impacts from mining activities include: displacement of soil from wind and water erosion, change in and degradation of soil structure and natural fertility, salt migration through the soil profile after reconstruction, and significant problems in revegetation and stabilization on steep slopes.

Disturbance of the soil would result in alterations of soil structure and porosity. This alteration would affect permeability, infiltration rates, soil-air and soil-water relationships and bulk density. The natural fertility would be affected by disruption of the nutrient cycle and a decrease in organic matter content within the soil.

The soil mapping units in the Northwest Otter coal tract were evaluated for suitability of soil material for plant growth using USDA/SCS guidelines for "Soil Reconstruction Material for Drastically Disturbed Areas" [NSH 403.6(a)]. These results are expressed as acre feet of soil material having good, fair and poor suitability due to its physical and chemical properties. This showed 4% (757 acre feet) of the area rated good, 37% (7,147.5 acre feet) rated fair and 59% (11,636.5 acre feet) rated poor as to suitability for plant growth (Table NWO-6).

Wind erosion potential for the tract is rated as 42% low and 58% moderate and the water erosion potential is rated as 3% low, 52% moderate and 45% high.

Areas within the tract may have poorer or better reclamation potential because of the unique soil distribution patterns. Suitable overburden materials, if available, could be used to provide additional material to provide for more adequate reclamation. Current information demonstrates that this area has fair to poor potential for successful reclamation.

WATER RESOURCES

Groundwater

Removal of coal and overburden within this tract would eliminate the wells and stock ponds that currently exist. The resulting pit would act as a well and intercept groundwater flow, which would be pumped back to surface ponds and eventually stream channels. Drawdown caused by this dewatering could affect at least seven wells located close to this proposed tract.

TABLE NWO-6
NORTHWEST OTTER CREEK SOIL RECLAMATION ASSESSMENT

Mapping Unit Symbol	Mapping Unit Name	Acres	Pct. of Area	Slope	Erosion Potential From Wind	Erosion Potential From Water	Suitability of Soil Material for Plant Growth (acrefeet)		
							Good	Fair	Poor
122D	Birney-Cooers-Kirby	110	2	2-15%	Low	Moderate	56	86	402
121E	Birney-Kirby channery loams	18	<1	4-25%	Low	High	10	10	70
123E	Birney-Kirby channery loams, moist	28	1	15-25%	Low	High	15	16	109
127F	Birney-Kirby-Cabbart	191	4	25-70%	Low	High	11	160	724
Ca	Delpoint-Yamac-Cabbart	124	3	8-25%	Moderate	High	29	171	273
181F	Cabbart-Armells-Rock outcrop	14	4	25-70%	Low	High	2	12	43
184F	Cabbart-Yawdim-Rock outcrop	133	3	15-70%	Low	High	7	124	330
Ce	Yamac-Delpoint	31	1	4-8%	Low	Moderate	14	53	88
498E	Delpoint-Cabbart-Yamac loams	138	3	8-25%	Moderate	High	57	170	334
497F & 498F	Delpoint-Cabbart-Yawdim	473	10	25-70%	Moderate	High	38	534	1310
Ec	Delpoint-Yamac	213	4	2-4%	Low	Moderate	79	364	622
El	Delpoint-Yamac	42	1	4-8%	Low	Moderate	20	72	123
Fn	Fengus-Relan association	76	2	2-8%	Low	Low	47	166	168
101C	Gerdrum-Kobar silty clay loams	75	2	2-8%	Low	Moderate	8	192	153
Hc	Haverson silt loam	23	<1	0-2%	Low	Moderate	-	115	-
Hd	Haverson silty clay loam	27	1	0-2%	Low	Moderate	-	135	-
Hf	Haverson soils, channeled	3	<1	0-4%	Low	Moderate	-	15	-
Hm	Heldt silty clay loam	31	1	4-8%	Low	Low	-	16	140
Hp	Hesper silty clay loam	1	<1	4-8%	Low	Low	-	0.50	4.50
Hs	Hopley and Relan loams	7	<1	4-8%	Moderate	Moderate	11	10	9
37D	Lonna silt loam	7	<1	4-8%	Low	High	-	-	-

TABLE NWO-6 (cont.)
NORTHWEST OTTER CREEK SOIL RECLAMATION ASSESSMENT

Mapping Unit Symbol	Mapping Unit Name	Acres	Pct. of Acres	Slope	Erosion Potential From Wind	Erosion Potential From Water	Suitability of Material for Plant Growth (acrefeet)		
							Good	Fair	Poor
Md	McRae silt loam	71	1	2-4%	Moderate	Moderate	30	325	-
Mg	Yamac-Delpoint	1378	28	4-15%	Moderate	Moderate	-	2,012	3,721
Mt	Kobar silty clay loam	152	3	4-15%	Moderate	High	-	679	27
Mw	Delpoint-Cabbart-Yawdim	409	8	15-35%	Moderate	High	33	634	663
Nh	Birney-Cabbart	80	2	8-15%	Low	Moderate	3	94	174
Rs	Birney-Kirby	47	1	20-50%	Low	High	-	30	117
Rt	Birney-Kirby-Cooers	380	8	4-70%	Low	High	-	323	1037
Ru	Ringling-Relan	426	9	6-25%	Low	Moderate	230	460	656
Sl	Shale outcrop	12	<1	-	Moderate	High	-	-	-
Te	Terrace Escarpments	28	1	-	Moderate	High	-	18	76
To	Thurlow silty clay loam	18	<1	4-8%	Low	Moderate	-	53	8
49C	Yamac loam	21	<1	2-8%	Low	Moderate	19	26	59
492C	Yamac-Busby	28	1	2-8%	Moderate	Moderate	26	55	52
493C & 493D	Yamac-Rentsac	20	<1	2-15%	Low	Moderate	12	17	44
	Total	4,835	100				757	7,147.5	11,536.5
	Percent of total material available						4%	37%	59%

Spoil material placed back in the pit would result in degraded quality of water that recharges and passes through the spoils. Water quality impacts would be limited to the mined areas and downgradient in horizontal extent and above the confining Lebo Shale in vertical extent. Downgradient dissolved solids concentrations are estimated to reach an average level of 3,650 mg/l. The expected existing concentration is 1,740 mg/l. Postmine water quality, like existing water quality, would be highly variable. This water would still be useable for watering stock.

Groundwater flow patterns would be reestablished after mining ceases. Unaffected deeper aquifers are available for substitute water sources.

With a contribution of increased dissolved solids from bedrock aquifers, average concentration of water in alluvium would be about 4,700 mg/l, an increase of about 1,650 mg/l. Additional work is being done by USGS to refine the expected effects mining would have on Otter Creek and its alluvium.

Mining proposed tracts in the Otter Creek area would have minimal and insignificant effects on the Tongue River.

Surface Water

Surface water would be affected by surface mining primarily during the mining period, when existing drainage patterns in parts of the area would be displaced, runoff would be intercepted, and existing reservoirs would be removed from the mined area. Since alluvium is likely to be drained by mining, ephemeral streamflow may be slightly reduced as water infiltrates to the alluvium.

Channels might have to be diverted around the mine pit to carry their natural flows. The channelization could decrease annual and low flow rates because of seepage loss to the pit. Peak flows should be somewhat reduced. Water discharging from disturbed areas, after passing through sediment ponds, would have almost all sediment removed, thus increasing erosive capabilities of the water

Channelization of stream courses could cause increased flow velocities, and the release of production water, including mine drainage, could alter the flow characteristics of streams. Erosion and sedimentation might increase during construction and operation of a mine, after the removal of vegetation and before its reestablishment on reclaimed areas.

Special protection would have to be given to Otter Creek, since it is used for flood irrigation. A careful evaluation of effects from mining on Otter Creek is presently being made by USGS.

Alluvial Valley Floors and Floodplains

Plants drawing from subsurface water (subirrigation) in the alluvium would be influenced to a slight degree by increased ground water chemical concentrations following mining. The effect would be greatest in the subirrigated land adjacent to the tract; downstream land would be less affected, because less concentrated water from outside the tract would dilute the increases in concentration from mining the tract. Crops that are more sensitive to salts would be affected more than less sensitive ones. For example, alfalfa is more sensitive than barley.

VEGETATION

If the range were in excellent condition (76%-100%) and the entire area were mined, there would be an approximate loss of 1,132 to 1,625 AUMs. However, in its present condition, the loss would be approximately 1,024 AUMs.

Mining of the area would temporarily eliminate opportunities for domestic livestock to occupy the surface and to utilize the forage. However, vegetative production may be better after mining (due to extensive reclamation work) and the area may produce more than the current number of AUMs per acre. There is, however, no evidence that the plant community that ultimately evolves would support higher levels of livestock grazing than the premining vegetation supported.

Additional impacts resulting from vegetative disturbances would be: (a) possible reduction of the visual aesthetics, (b) increased soil erosion, and (c) reduction in the amount of wildlife and livestock forage.

AGRICULTURE

If this area is mined, there would be approximately 484 surface acres suitable for cropland that would be lost for the term of mining and reclamation operations. This land could produce approximately 4,679 bushels of wheat (based on 50% land, summer fallow; 50% land, wheat) or 432 tons of hay annually under dryland conditions. There are 148 surface acres suitable for irrigation that could produce an additional 5,864 bushels of wheat or 581 tons of hay annually. However, only 110 acres (22.73%) of the suitable cropland is currently utilized as cropland.

OWNERSHIP AND LAND USE

As a result of leasing, industrial activities would be introduced into an area that has had no such previous activities. There is little ability to support mining without construction of major facilities, improvement of existing and creation of new transportation routes, and construction of powerlines. Impacts are expected to be moderate to high.

If the tract is mined, the county road that crosses one mile of the tract would have to be relocated. Assuming a 100-foot right of way, and assuming that at least two miles of new road would be needed to relocate the old road, then the surface disturbance would total 24 acres. Construction of access roads from the Otter Creek Road to the mine tract would cause additional surface disturbance. Approximately 36 acres would be disturbed by construction of three miles of rail spur to the proposed Tongue River Railroad.

WILDLIFE

The activities of mule deer which now use the tract would be displaced to adjacent Custer National Forest lands with minimal impact.

Habitat loss to mining would displace up to 40 antelope from a winter concentration area in Sections 5, 7, 8, and 17, T4S, R45E. All or portions of this area would be disturbed during the life of the mine. (BLM-Tract Profile).

Poaching and road kills have increased dramatically in areas of Montana, Wyoming and Colorado, where energy development has occurred. The problem is compounded in areas where shift changes coincide with feeding periods, especially big game (Streeter, et al 1979). The same would probably occur in this area.

If mining degrades water quality in Otter Creek, there would be reduced spawning success of gamefish in the lower reaches of the creek.

CULTURAL RESOURCES

Should the area be mined, haul roads, vehicle traffic and soil erosion would result in destruction of all cultural sites in the mine area and an adverse effect to sites immediately adjacent. Prior to actual mining, presently unsurveyed areas within the mine tract would be inventoried and eligible sites mitigated through data recovery, pending consultation with the State Historic Preservation Officer and the Advisory Council on Historic Preservation.

RECREATION

No significant long-term impacts are expected to occur on the tract. Some secondary impacts would occur. Overall recreational demand on federal and private lands would increase due to population increases. The construction or relocation of roads at the mine site might improve legal and/or physical access to some areas. These increases could reduce levels of recreation enjoyment due to increased crowding, litter and pollution on public lands.

VISUAL RESOURCES MANAGEMENT

Mining would completely change the character of the tract. Visual impacts would increase in the form of land disturbances due to roads, railroads and utilities. Changes to the topography, vegetation and scenic quality would occur. Currently, there are no industrial influences in the area, so the contrast would tend to be extreme. Along with this, some decrease in visibility would occur from dust and vehicle emissions. Overall, adverse impacts would be relatively insignificant both during and after mining, because the mine would not be readily visible from any major highway and the topography would not be significantly altered after reclamation. There is a small amount of above average, "Class B", scenery which would be affected. Due to the location, these visual impacts would be experienced only by persons visiting the mines. Increased vehicle traffic on U.S. Highway 212 can be expected because of mining on this tract. This would have a visual impact upon the Northern Cheyenne Indian Reservation. All of the impacts would either cease or be reduced to low levels after the completion of mining and reclamation.

CLIMATE AND AIR QUALITY

Impacts on climate from the proposed action would be localized and insignificant. Reclamation would mitigate any impacts over the long term that surface modification could cause to climatic conditions.

During full coal production, the highest annual average ambient concentrations of total suspended particulates (TSP) for locations off the mine site are estimated to be 31 mcg/m^3. This included the 20 mcg/m^3 background concentration. Montana's allowance standard is 75 mcg/m^3.

Montana also has a 24-hour standard of 200 mcg/m^3 that cannot be exceeded more than once a year off the mine site. With the background concentration added, the second highest 24-hour values for TSP with the proposed action during full coal production was modeled to be as high as 54 mcg/m^3.

Visibility reductions resulting from the second highest 24-hour concentrations would be a maximum of 0.4 mile. When looking from the Northern Cheyenne Indian Reservation, the same reduction would be a maximum of 0.3 mile.

More detailed and site specific air quality data for this tract will be forthcoming from a study underway by PEDCo Environmental. A more accurate prediction of impacts to air quality will be included in the study results.

Application of best available control technology must be a part of any mining activity. Without these controls, concentrations would be increased dramatically.

NOISE

Effects of mine related noise are generally confined to the mining and adjacent areas and have little impact elsewhere (Colstrip project DEIS Vol 1). Noise sensitivity for land uses that would be affected in this area, namely mining and grazing, have been rated as insensitive (Mestre and Wooten 1980).

Besides blasting, the greatest mining noise would emanate from the dragline. At a distance of 300 feet, the noise level of an electric dragline is 59 dBA. A noise level of 90 dBA can be tolerated for eight hours without a risk of hearing loss (Mestre and Wooten). According to a "Trend of Public Reaction to Peak Noise Near Residences," (Mestre and Wooten), noise levels up to 67 dBA are accepted with complaints rare. Sound levels may exceed 110 decibels during blasting (East Decker Coal Mine DEIS). A noise level of 110 dBA can be tolerated for up to one-half hour per day before there is a risk of hearing loss.

Effects of mining noises on animals is often that of dispersing them into areas away from the mine site. Experience is showing, however, that animals do become accustomed to the noise and return to reclaimed areas with a mine still in operation. Western Energy Company has an established sharp-tailed grouse lek on one of their reclaimed areas and they often see deer frequenting the site. Indeed, some researchers have complained of the nuisance wild animals can be in revegetation attempts (Schwarzkoph 1982).

TRANSPORTATION FACILITIES

Approximately one mile of the Otter Creek road that crosses the southeast portion of the tract would be relocated if the tract were mined. The remainder of the road north to Route 212 may have to be widened and resurfaced to handle an increase in traffic due to the mine. Additional access roads would be built from this road to the tract. A three-mile spur line would be built to tie the mine into the proposed Tongue River Railroad.

SOCIOECONOMICS

There are two characteristics of the likely population increase due to mine development that can be predicted. First, it would be in the 19-35 year age range and, secondly, it would have quite different occupations than generally found in the region.

The younger aged population would also bring with it different lifestyles in some respects from those of the long-term residents. However, there is no reason to believe potential conflicts between lifestyles cannot be reconciled.

One of the most important changes in community organization to occur with the influx of new population, particularly in rural towns, is a change from informal interpersonal relations and organization to more formal and institutional types of relationships. The longstanding friendships between long-time residents would be maintained, but become a much smaller part of the total community.

The population increase could well transform a small rural community to a small urban community (Powder River MFP Amendment 1982).

Economics (Agriculture)

Coal development would displace some agricultural production. To evaluate this issue, it was necessary to compare the value of the agricultural production displaced with that of the coal to be developed. The trade-off was compared two ways.

One was to compare the net national value of agricultural production displaced with the net national value of coal produced. In this evaluation, it was assumed the net value of coal is 12.5% (minimum royalty rate) of the assumed market rate for coal of $10 per ton. The net value of agricultural production is the cash rent to the landowner. A "worst case" situation was assumed for agriculture, that is, the area would not be reclaimed. Since agricultural production would be lost on each acre, year after year, these losses were totaled to show losses in perpetuity. By comparison, coal output per acre is gained only once. To place agricultural production and coal on the same time basis, it was necessary to discount the value of agricultural output lost in future time periods. Regardless of inflation, a loss in agricultural production in the future is worth less than if it were lost today because of the time value of money.

Under these assumptions, Table NWO-7 shows the return to national income from federal coal production in Powder River County is over 1,443 times greater than any displaced agricultural production. There is no federal coal in Rosebud County in this tract.

Another way of comparing the trade-off between coal and agricultural resources is to determine what coal would have to sell for to be equal to agricultural production displaced. This avoids assuming all coal in the area could be sold for the going market value. Table NWO-7 shows that coal in Powder River County would have to sell for only $.0003 per ton to be equal to the net agricultural values displaced. Private (fee) coal would have to sell for $.00025 per ton in Rosebud County.

Concern has been expressed that extensive strip mining could have an effect on the supply of agricultural land and thus the national food supply. To gain a perspective on this issue, the value of agricultural production to be potentially displaced by mining can be compared with the value of agricultural output in the consideration area. Table NWO-8 shows mining of the federal coal in the consideration area in Powder River County and Rosebud County could displace 0.12 to 0.13% of each county's total agricultural production.

A "worst case" scenario was assumed, in the above comparison, that the area would not be reclaimed. Existing state and federal laws require the lands to be returned to the approximate original contour and be reseeded to native species. Evidence collected on current reclamation efforts suggests postmining productivity is similar to premining productivity, at least in the short term.

Long term results are yet to be evaluated, as reclaimed lands have not been monitored over a long period of time.

Regional Economics

Due to the uncertainty of the market for coal, it is not possible to display actual yearly tonnage figures, employment figures and time frames for this proposed mine. If this tract is sold at a future coal lease sale, community leaders of all possible impacted communities should establish communications with the lessee at the earliest opportunity. This communication would enable leaders to have access to more exact figures and time frames. The coal company must apply for a permit to mine by furnishing a proposed mine plan to the Montana Department of State Lands. Upon approval of a final EIS, this permit is issued.

Possible impacts from mining coal are identified using a typical 7.9 million ton per year mine. Figures used are all assumed and should not be used by local community leaders for making final determinations. They should be used as a guide to show what future impacts could be.

During the construction stage of a mine, approximately 2 years, employment would be short range, utilizing many members from all construction trades. It is assumed that for this mine scenario, this figure would peak at

TABLE NWO-7
COMPARISON OF VALUE OF AGRICULTURAL PRODUCTION DISPLACED TO VALUE OF COAL PRODUCTION

		Agricultural Production						Coal Production					
County	Crop	Acres	Annual Ag Production	Net Value Per Unit	1/ Total Annual Net Value $	2/Total Present Value at 10%	3/ Per Acre Loss If Mined	Federal Acres	Recoverable Tons/Acre	4/Net Value Per Ton $	5/Total Present Value 10^3	6/ Ratio to Ag Prod.	7/ Value per ton to equal Ag. Prod.
Powder River	Hay	70	83 tons	$20.00 ton	$1,660	$ 16,600							
	Tame Pasture	40	36 AUMs	$10.00 AUM	360	360							
	Range-land	3,469	761 AUMs	$10.00 AUM	7,610	76,100	$26.90	1,350	82,360	$1.25	$138,980	1,443 to 1	.0003
TOTAL		3,579			$9,630	$ 96,300							
Rosebud	Range-land	1,256	263 AUMs	$10.00 AUM	$2,630	$ 26,300	$20.94	0	0	0	0	0	0
TOTAL		1,256			$2,630	$ 26,300							

1. Annual agricultural production x net value per unit
2. Total present value discounted at 10%
3. Total present value/total acres
4. 12.5% x assumed value of $10.00 per ton at mine mouth
5. Acres x tons/acre x net value per ton
6. Total present value (coal)/total present value (agriculture)
7. Agricutlural production per acre loss if mined/tons per acre

TABLE NWO-8
COMPARISON OF COAL TRACT ANNUAL AGRICULTURAL PRODUCTION TO COUNTY TOTAL AGRICULTURAL PRODUCTION

	HAY			CATTLE					
County	1/ Annual Production (Tons)	2/ Annual Sales $	Percent of County Sales	Annual Production (AUMs)	3/ Annual Sales	Percent of County Sales	4/ Gross Annual Agr. Sales by Coal Area	5/ Gross Annual Agri Sales by County	6/ % of County Agri Production Displaced
Powder River	83	$ 4,565	0.50	797	$19,925	0.13	$24,490	$18,831,000	0.13
Rosebud	0	0	0	263	$ 6,575	0.015	$ 6,575	$ 5,549,000	0.12

1. Montana Agricultural Statistics, Vol XV III, December 1981, Color World Montana Inc., Bozeman, MT: 1979 value $3.21 bushel x total bushels = annual value of wheat production
2. Tons x $55 = value of annual sales
3. AUMs ÷ 12 AUM/Cow = cow units x 300 sales per cow unit = value of annual cattle production
4. Total of two annual sales columns
5. 1978 Census of Agriculture, Department of Commerce, US Printing Office, Washington, DC, June 81
6. Value of production displaced as a percentage of all agricultural production in the county

approximately 355 workers. Case studies of other developments indicate that construction workers tend not to relocate, but rather commute long distances daily or weekly. Only about 30% of the in-migrants have families averaging 3.2 persons per household. Therefore, the 355 peak number of workers would add approximately 590 people to the total population of the area.

Operational workers for this size of a mine would number 237. Operational workers would be more permanent and a larger percentage (75%) would bring families into the area. Population impact of operational workers would be 628 additional people into the area.

Secondary employment or local service employment in small communities is related to households and population. This is complicated by the fact that most local service workers do not represent new in-migration. These jobs are often filled by second-job holders (wives, young people) in the base population or from among the families of in-migrating construction or operating workers. Such jobs have very beneficial economic impacts since they add to family income without adding significantly to the population base.

For the proposed Northwest Otter Creek mine, it is assumed that 40% of the construction and operations workers would reside in Ashland. Another 40% would reside in Broadus and commute to the job site. The remaining 20% of the workers would come from the present residents of the Indian reservations and immediate areas of the two counties.

Table NWO-9 displays the forecasted impacts to Powder River and Rosebud Counties if the Northwest Otter Creek tract mine is developed. The construction phase would cause a 9.4% increase to Powder River County and a 2.4% increase to Rosebud County. This population increase would require temporary housing such as apartments, motels, mobile homes, mobile home parking pads, and recreational vehicle pads.

The operational workforce would be more permanent and would be looking for permanent housing. A 10% increase for Powder River County and a 2.5% increase to Rosebud County would be caused by this development.

Although these projected population impacts are small, there would be additional expenses to towns and counties to provide for the additional services needed. Due to the sparse population of this region, assistance may be required from the coal lessee to provide the necessary services. In the short term additional fees and taxes would be required to generate additional revenues. After the mine is developed, taxes should decrease, as the mine would be making a large contribution to the county tax base.

The State of Montana would also receive additional revenues from new development. Assuming a 7.9 million ton per year mine and a price of $10 per ton, the state would receive approximately 23.7 million dollars per year in severance tax. In addition, the state would receive one-half of the federal royalties collected by the federal government for the federal coal that is mined. State income tax and other taxes would show a significant gain from development.

Employment of the Crow and Northern Cheyenne Indians would help to eliminate a high unemployment rate. However, mine development may cause additional traffic through the reservations by commuting workers. The largest use of reservation roads is projected to come from Indian workers residing on the reservation.

To market this coal at a reasonable price, a railroad connection such as the Tongue River Railroad would have to be constructed. Trucking of coal from the mine to the present railroad would add to the cost of mining and may make it difficult to sell. The Interstate Commerce Commission is presently preparing an EIS on the feasibility of constructing this railroad. Results of their findings will not be known until early in 1983.

NET ENERGY ANALYSIS

A net energy analysis calculated by the BLM (W.O. IM 79-282) indicates that an average of 37.7 British thermal units (BTUs) would be expended to produce each pound of coal from the Northwest Otter Creek tract. In turn, a pound of coal would produce about 8,506 BTUs. The ratio of energy produced to that expended would be more than 225 BTUs to 1 BTU.

TABLE NWO-9
FORECASTED IMPACTS

County/Community	Phase	1/ Employees	No. with Families	Average Size	4/ Total Population Impact	% County Increase	5/Projected Housing Needs	6/ School Children
Powder River	Construction	142 2/	43	3.2	237	9.4	91	34
(Broadus)	Operations	95 3/	71	3.2	251	10.0	97	57
Rosebud	Construction	142 2/	43	3.2	237	2.4	91	34
(Ashland)	Operations	95 3/	71	3.2	251	2.5	97	57

1. 40% of total employment for each county.
2. 30% with families
3. 75% with families
4. 1980 census Powder River County, 2,520; Rosebud County 9,899
5. Total population impact ÷ 2.6 average of households in 1980 census
6. Estimated 0.8 school children per new family

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NORTHWEST OTTER CREEK UNSUITABILITY SUMMARY

UNSUITABILITY CRITERIA RESULTS

Criterion	Applicable to Tract	Exception Used	Additional Data Needed	Comments
1. Federal land systems	No			
2. Rights-of-way and easements	No			
3. Buffer zones for roads, buildings, etc.	No			
4. Wilderness study areas	No			
5. Scenic areas	No			
6. Land used for scientific study	No			
7. Historic lands and sites	No			
8. Natural areas	No			
9. Federally listed endangered species	No			
10. State listed endangered species	No			
11. Eagle nests	No			
12. Eagle roosts and concentration areas	No			
13. Falcon cliff nesting sites	No			
14. Migratory birds	No			
15. State high-interest fish and wildlife	No			
16. Floodplains	Yes		Need to determine if there is a substantial threat to life or property.	No area excluded.
17. Muncipal watersheds	No			
18. National Resource Waters	No			
19. Alluvial valley floors	Yes		Need to determine actual extent.	No area excluded.
20. State proposed criteria	No			

APPENDIX

SUMMARY OF RESOURCE AND ENVIRONMENTAL CONSIDERATIONS
NORTHWEST OTTER CREEK COAL LEASING TRACT

Element	Present Situation	Anticipated Effect of Leasing and Development	Significance of Anticipated Effect	Data Reliability	Comments
GEOLOGY AND TOPOGRAPHY					
Geology					
Locatables	None known	None	Low	Good	
Leasables	Oil and Gas	Temporary delay in possible exploration.	Low	Good	
Saleables	Scoria	Some scoria destruction possible; some scoria use for ancilary mining activities.	Low	Fair	
Paleontological	Fossils	Some fossil destruction, rearrangement of other fossil material.	Low	Poor	
Topography	Light to moderately rolling uplands; some very rough country, with coulees draining both east and west.	Topography would be gentler, with lesser slopes than now. Average elevation of mined area would be less than at present.	Low	Fair	

APPENDIX

SUMMARY OF RESOURCE AND ENVIRONMENTAL CONSIDERATIONS
NORTHWEST OTTER CREEK COAL LEASING TRACT

Element	Present Situation	Anticipated Effect of Leasing and Development	Significance of Anticipated Effect	Data Reliability	Comments
SOILS	Thirty-five mapping units have been identified in the tract. These soil units may be found along fans, footslopes and strongly sloping to very steep hillsides.	There would be: displacement of soil by water and wind erosional forces, change in soil structure and natural fertility, and significant problems in revegetation and stabilization on steep slopes.	Moderate to high	Data reliability is 25% for the Big Horn County Soil Survey and 85% for the Rosebud County unpublished survey. Better soils in the bottomlands are more accurately mapped than those on the rangelands and steep-sided slopes.	

APPENDIX

SUMMARY OF RESOURCE AND ENVIRONMENTAL CONSIDERATIONS
NORTHWEST OTTER CREEK COAL LEASE TRACT

Element	Present Situation	Anticipated Effect of Leasing and Development	Significance of Anticipated Effect	Data Reliability	Comments
WATER RESOURCES					
Groundwater					
Occurrence	Two wells exist in tract. Static water levels range from about 38 to 230 feet.	Destruction of existing wells.		There may be more wells on tract.	Supplies could be replaced by deeper wells at considerable expense.
Quantity	10 gallons per minute				
Conductance	2,441-4,110 micromhos per centimeter	4,857 - 6,143 micromhos per centimeter		Good	
Dissolved solids	Average of 1,740 mg/l for bedrock aquifers. 3,050 mg/l for alluvial aquifers	Average of 3,650 mg/l for bedrock aquifers. 4,700 mg/l for alluvial aquifers		Good	
pH	7.3 - 8.5	Lower in spoils aquifer		Good	
Importance for homes or towns	Probably some domestic use.	Loss of present supply	Minor		

APPENDIX

SUMMARY OF RESOURCE AND ENVIRONMENTAL CONSIDERATIONS
NORTHWEST OTTER CREEK COAL LEASE TRACT

Element	Present Situation	Anticipated Effect of Leasing and Development	Significance of Anticipated Effect	Data Reliability	Comments
Importance for industry	Nil				
Importance for livestock and wildlife	Primary use	Loss of present supply	Moderate		
Importance for agriculture	Nil				
Surface Water					
Occurrence	Only ephemeral streams and 3 known stock ponds.	Removal of reservoirs during mining.	Minor		
Quantity	Unknown				
Conductance	260-3,900 micromhos per centimeter	Possible increase during mining	Minimal	Fair	
Dissolved solids	149-2,690 milligrams per liter (mg/l)	Possible increase during mining	Minimal	Fair	
pH	7.2 - 8.6	Little change		Fair	

APPENDIX
SUMMARY OF RESOURCE AND ENVIRONMENTAL CONSIDERATIONS
NORTHWEST OTTER CREEK COAL LEASING TRACT

Element	Present Situation	Anticipated Effect of Leasing and Development	Significance of Anticipated Effect	Data Reliability	Comments
Importance for homes or towns	Nil				
Importance for industry	Nil				
Importance for live-stock and wildlife	Primary use	Loss of some supplies during mining	Moderate		
Importance for agriculture	Some flood irrigation along Otter Creek	Could deteriorate due to mining	Still being studied		
VEGETATION	Range Sites: (Acres) Shallow silty 762 Silty 335 Grazeable Woodlands 504 Shallow, Sh-Clay 1,378 Shallow clay 409 Other 1,337 Total 4,725	Acres being disturbed: (Acres) Shallow Silty 762 High Silty 335 High Grazeable Woodlands 504 High Shallow, Sh-clay 1,378 High Shallow clay 409 High Other 1,337 Low	High - - - - Long term elimination of the natural vegetation mosaic and species diversity	Good	Reclamation of Ponderosa pine not yet proven

APPENDIX

SUMMARY OF RESOURCE AND ENVIRONMENTAL CONSIDERATIONS
NORTHWEST OTTER CREEK COAL LEASE TRACT

Element	Present Situation	Anticipated Effect of Leasing and Development	Significance of Anticipated Effect	Data Reliability	Comments
Animal Unit Months	1,024 AUMs	Loss of 1,024 AUMs	High	Good	
Animal Unit Months if range is in excellent condition 76-100%				Good	76% 1,132 AUMs 100% 1,625 AUMs
Reclamation Vegetation	On federal, state and private lands, the Office of Surface Mining (OSM) assures that the mining company establish a diverse, effective and permanent vegetative cover to standards set by the Department of State Lands of Montana and the federal Bureau of Land Management	Low	High-failure of reclamation, Low-success of reclamation	Good	

APPENDIX

SUMMARY OF RESOURCE AND ENVIRONMENTAL CONSIDERATIONS NORTHWEST OTTER CREEK COAL LEASING TRACT

Element	Present Situation	Anticipated Effect of Leasing and Development	Significance of Anticipated Effect	Data Reliability	Comments
AGRICULTURE	484 acres suitable for cropland. 110 acres currently being cropped (70 acres, Hay; 40 acres, tame pasture).	Maximum of 110 current cropland acres removed from production for term of mining and reclamation operations.	Low	Good	
LAND USE	No industrial activity. Ranching is primary use with some farming occurring.	Introduction of industrial activities. Land required for mines, railraods, access roads, and powerlines.	Moderate to high during mining. Low to none after reclamation.	Good	
WILDLIFE					
Big Game					
Mule Deer	Limited Use	Displacement to adjacent Custer National Forest.	Low	Good	
Antelope	Limited Use	Displacement to surrounding areas.	Low	Good	
Sharp-tailed Grouse	Two leks over private coal	Loss of some use areas.	Low	Good	
Fish	Lower Otter Creek used for spawning	Game and forage fish in Tongue River could be reduced.	Low -- Moderate	Good	

APPENDIX

SUMMARY OF RESOURCE AND ENVIRONMENTAL CONSIDERATIONS
NORTHWEST OTTER CREEK COAL LEASING TRACT

Element	Present Situation	Anticipated Effect of Leasing and Development	Significance of Anticipated Effect	Data Reliability	Comments
Threatened and Endangered Species					
Bald Eagle	Migrate through area	Insignificant	Insignificant	Good	
CULTURAL RESOURCES	All 1,350 acres of uncommitted federal estate have been inventoried. 24 sites were located.	Disturbance and destruction of all sites within mine area, indirect effects to sites adjacent.	Loss of resource, loss of heritage values.	Good; some parcels inventoried twice	Prior to mining the mine plan area would be completely inventoried, and National Register sites mitigated
RECREATION	No developed recreation sites in the tract. A few miles south of this tract lies an area recommended for wilderness by the Custer National Forest.	Reduced hunting in this area.	Moderate	Good	
VISUAL RESOURCES	Area is rated as Class III.	Classification would change to V during life of mine.	High effects during life of mine, but the long term effects would be low because reclamation would have to restore tract to Class III	Good	

APPENDIX

SUMMARY OF RESOURCE AND ENVIRONMENTAL CONSIDERATIONS
NORTHWEST OTTER CREEK COAL LEASING TRACT

Element	Present Situation	Anticipated Effect of Leasing and Development	Significance of Anticipated Effect	Data Reliability	Comments
AIR QUALITY	Concentration of particulates estimated at 20 mcg/m^3 (Mt standard is 75 mcg/m^3).	Highest annual ambient concentration of particulates would be 31 mcg/m^3.	Minor	Fair	
NOISE	Sources are wind, agricultural activity, and vehicular traffic. Estimated noise level is 40 dB.	Substantial increase in noise due to blasting, equipment, and more vehicle and railroad traffic. Zones of increase to 50dBa for 1/3 mile around tract, 1,000 feet from railroad centerline, and for 100 to 200 feet from access road centerline.	Insignificant	Acceptable	There are no land uses in affected zones that are sensitive to high noise levels.
TRANSPORTATION	Existing access via graveled county road, part of which lies across tract. Low use and maintenance.	Increased traffic on Otter Creek road and U.S. Route 212.			
		Construction of new access roads, and improvement of existing roads. Construction of 3-mile rail spur.	Moderate to high		
		Relocation of a portion of Otter Creek Road.			

APPENDIX

SUMMARY OF RESOURCE AND ENVIRONMENTAL CONSIDERATIONS
NORTHWEST OTTER CREEK COAL LEASING TRACT

Affected Community	Affected 1978 Element ($1000)	Anticipated Effect of Action	Assumptions	Significance of Effect
AGRICULTURAL ECONOMICS				
Powder River Co.	Annual Agricultural Receipts $18,831	- $ 4,565	Assumes all 70 acres of hay disturbed. Less than 1% of county agricultural production	Low
		- $19,925	Assumes all 797 AUMS are lost for life of mine. Less than 1% of county agricultural production.	Low
Rosebud County	Annual Agricultural Receipts $28,997	- $ 6,575	Assumes all 263 AUMs are lost for life of mine; less than 1% of county agricultural production.	Low

APPENDIX

SUMMARY OF RESOURCE AND ENVIRONMENTAL CONSIDERATIONS NORTHWEST OTTER CREEK COAL LEASING TRACT

Element	Affected Community	Affected Action	Significance of Effect	Data Reliability
EMPLOYMENT AND POPULATION				
Employment				
Construction of Mine	Powder River County	142 more jobs	Low: 10.5% increase in county employment	good
	Rosebud County	142 more jobs	Low: 2.8% increase in county employment	good
Operation of Mine	Powder River County	95 more jobs	Low: 7.0% increase in county employment	good
	Rosebud County	95 more jobs	Low: 1.9% increase in county employment	good
Population				
Construction of Mine	Broadus Area	237 more people	High: 33% increase	good
	Ashland Area	251 more people	High: 42% increase	good
Operation of Mine	Broadus Area	237 more people	High: 35% increase	good
	Ashland Area	241 more people	High: 44% increase	good

UNITED STATES DEPARTMENT OF THE INTERIOR
MINERALS MANAGEMENT SERVICE

PART II

1984 Lease Sale — Coal

Summary Report — Northwest Otter Creek Tract
Northern Powder River Basin
Rosebud and Powder River Counties, Montana

North Central Region
Billings, Montana

November 1, 1982

TRACT SUMMARY REPORT

Minerals Management Service, North Central Region
Billings District
Billings, Montana

Date: November 1, 1982

TRACT DESCRIPTION

Tract Name: Northwest Otter Creek No.:

Coal Region: Northern Powder River Basin

State: Montana County: Rosebud, Powder River

BLM Resource Area and Planning Unit: Powder River

USGS Quadrangle Maps: Willow Crossing, Ashland, King Mountain

Legal Description: See Attachment A and Attachment B (Tract Location Map)

Known Recoverable Coal Resource Area (KRCRA): Northern Powder River

Tract Acres (by BLM)
Federal Uncommitted: 1350
Federal Committed: 0
State: 640
Private (Fee): 3484
Total Tract: 5475

Approximate Acres Underlain by Coal:
Federal Uncommitted: 953
Federal Committed: 0
State: 640
Private(Fee): 2006
Total Tract: 3599

Estimated In-Place Coal Tonnage:
Federal Uncommitted: 106.2 MMT
Federal Committed: 0 MMT
State: 68.0 MMT
Private (Fee): 224.0 MMT
Total Tract: 398.2 MMT

Estimated Recoverable Coal Tonnage:

Federal Uncommitted: 89.2 MMT
Federal Committed: 0
State: 55.8 MMT
Private (Fee): 172.6 MMT
Total Tract: 317.6 MMT

ENTITIES EXPRESSING INTEREST

Meridian Land and Minerals Co.
Cities Service Co.
Chevron Resources Co.

COAL RESOURCE CLASS DESIGNATION

CLASS 1: Good

Confidence in resource estimates is good because the surface areas of category "A" and "B" resources cover two-thirds or more of the total surface area of the tract

CLASS 2: Moderate

Confidence in resource estimates is moderate because the surface areas of category "A" and "B" resources cover one-third to two-thirds of the total surface area of the tract.

CLASS 3: Poor

Confidence in resource estimates is poor because the surface areas of category "A" and "B" resources cover one-third or less of the total surface area of the tract.

POTENTIAL FOR DEVELOPMENT OF TOTAL TRACT
Northwest Otter Creek Tract

EVALUATION FACTORS	CLASS 1	CLASS 2	CLASS 3
Coal Resources	X		
Coal Quality	X		
Transportation			X
Minability		X	
Marketability		X	
Overall Class		X	

See Attachment C.

COAL RESOURCE CATEGORY DEFINITIONS

CATEGORY "A" RESOURCES

Resource quantity is estimated from data sources that are adequately spaced to assume, with a high degree of confidence, continuity between data points. The geologic character of the area is well defined. The resources for the Northwest Otter Creek tract in this category also meet the demonstrated reserves category of USGS Bulletin 1450-B.

CATEGORY "B" RESOURCES

Resource quantity is based on an assumption of continuity between data points with a lower confidence level than that of category "A" resources. The geologic character of the area is not as well defined as category "A" resources.

CATEGORY "C" RESOURCES

Resource quantity is based on an assumption of what can reasonably be expected to exist in the same producing region under analogous geologic conditions with a lower confidence level than that of either category "A" or "B".

POTENTIAL FOR DEVELOPMENT OF TOTAL TRACT

COAL TONNAGE OF NORTHWEST OTTER CREEK TRACT

Coal Bed	Average Thickness	Resources (million short tons)		
		Category A	Category B	Category C
Knobloch	62	398.2	---	---

Coal tonnages were calculated using the accepted unit weight of 1770 tons per acre-foot for subbituminous coal.

Federal, State, and privately held coal in this tract is all under Category "A". Only the Knobloch bed is considered here. Tonnages are given on page 1 of this report.

COAL QUALITY
TOTAL TRACT - NORTHWEST OTTER CREEK

(Values in percentage, except BTU)

Coal bed	Number of samples	Moisture	Volatile Matter	Fixed Carbon	Ash	Sulfur	BTU/lb
Knobloch	2	27.76	29.48	37.41	5.36	0.14	8,506
*Knobloch	3	24.39	32.04	39.51	4.05	.153	9,192
*Knobloch	7	27.36	29.65	38.33	4.64	.186	8,663

*Sample area is from 1 to 3 miles outside of Tract boundary.

GEOLOGY OF THE NORTHWEST OTTER CREEK LMST

The Northwest Otter Creek Tract lies near the northern margin of the Powder River Basin. The surrounding rocks are of the Paleocene Fort Union Formation and Eocene Wasatch Formation. The Tongue River Member of the Fort Union contains the most significant coal in the area.

Rock strata comprising the Tongue River Member in the area are essentially flat-lying, but do exhibit a regional southward dip of less than one degree.

The Tongue River Formation contains at least six persistent coal beds 5 to 35 feet thick and several other thin, less persistent, beds. The Knobloch bed is present within the tract boundary and has an average thickness of 62 feet.

There are no apparent geologic hazards in the tract.

References

American Society for Testing and Materials, 1971, Standard specifications for classification of coals by rank (ASTM Designation D 388-66) in gaseous fuel, coal and coke: pt. 19, p. 59.

Matson, R. E., Blumer, J. W., and Wegelin, L. A., 1973, Quality and reserves of strippable coal, selected deposits, southeastern Montana: Montana Bureau of Mines and Geology Bulletin 91, 135 p.

POTENTIAL USE OF COAL: Feedstock for electrical power plant or synfuel plant.

TRANSPORTATION:

	Mode	Distance to Transportation Link
Existing		
Being Developed		
Being Planned	Railroad	85 miles
None Planned		

MINABILITY:

Type of Mine: Surface mine using dragline or truck-shovel methods.

Estimated Recovery:

Based on current practices in the Powder River Basin coal region, a recovery factor of 90 percent is typical. However, this factor may or may not be achieved.

Estimated Annual Production:

Federal Uncommitted: 2.2 million tons

Total Tract: 7.9 million tons

Estimated Mine Life: 40 years

Estimated Surface Acres to be Mined Per Year:

Federal Uncommitted: 24

Total Tract: 90

Active, Inactive, and Abandoned Mines or Leases in Tract Vicinity:

The mines surrounding Colstrip are approximately 28 miles northwest of the tract.

MARKETABILITY

A single general expression of interest was received for the area. An overall rating of Class 2 was applied after considering the ratings for all the evaluation factors

DEFINITIONS AND ASSUMPTIONS FOR THE NORTHWEST OTTER CREEK TRACT: see Attachment D.

Attachment A

TRACT LEGAL DESCRIPTION

NORTHWEST OTTER CREEK

Principal Meridian, Montana

FEDERAL UNCOMMITTED		Acres
T. 3 S., R. 45 E.,		
sec. 30, lots 2, 3, and 4, E1/2SW1/4, and SE1/4.		351.89
T. 4 S., R. 45 E.,		
sec. 4, SW1/4SW1/4;		40
sec. 6, lots 10 to 17, inclusive, and N1/2SE1/4;		396.58
sec. 8, lots 1 to 6, inclusive, lot 8, and E1/2.		561.78
	Total	1,350.25
	Rounded Total	1,350
PRIVATE		
T. 3 S., R. 44 E.,		
sec. 25, All.		640
T. 3 S., R. 45 E.,		
sec. 31, lots 1 to 4, inclusive, E1/2, and E1/2W1/2.		628.8
T. 4 S., R. 44 E.,		
sec. 1, lots 1 to 7, inclusive, SW1/4NE1/4, S1/2NW1/4, SW1/4, and W1/2SE1/4.		615.9
T. 4 S., R. 45 E.,		
sec. 5, lots 2, 3, and 4, S1/2N1/2, and S1/2;		587.35
sec. 7, lots 1 to 4, inclusive, and S1/2;		532.28
sec. 9, W1/2E1/2 and W1/2.		480
	Total	3,484.33
	Rounded Total	3,484
STATE COMMITTED		
T. 3 S., R. 44 E.,		
sec. 36, All.		640
BYPASS COAL		
T. 4 S., R. 45 E.,		
sec. 6, lots 6 to 9, inclusive, and S1/2SE1/4.		229.13
	Tract Total (excluding bypass coal)	5,474.58
	Rounded Tract Total	5,475

Attachment B

TRACT MAP
-Northwest Otter Creek-

Please see the tract map at the beginning of Part I.

DETERMINATION OF CLASSES
- Northwest Otter Creek -

Coal Quality

The BTU content fell in this tract is moderately high when compared to other Powder River Basin coals. Also the percentage of sulfur is very low in comparison; therefore, a Class 1 rating was applied for this evaluation factor.

Transportation

The tract is located approximately 85 miles from an established rail line. Therefore, a Class 3 rating was applied.

Minability

In general the tract has one relatively thick seam and a maximum stripping ratio which is comparable to operating mines in the Basin. Bypass situations in sections 4 and 4 adversely affect the tract's overall minability. A Class 2 rating has, therefore, been applied.

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Attachment D

MINING ENGINEERING
DEFINITIONS AND ASSUMPTIONS
- Northwest Otter Creek -

Deductions from the in-place resource were made for buffer zones and highwall reduction zones. A recovery factor of 90 percent was then applied to the minable resource to determine the recoverable resource.

The rating for transportation was determined from the following table:

Rating	Distance to Established Transportation Link
Good	0-7 miles
Moderate	7-15 miles
Poor	15- miles

For a tract with more than one minable seam a weighted average proximate analysis was figured for the tract. The tract's proximate analysis was then compared to analyses from other marketed coals in the area for rating purposes.

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